

January 2011

# HEARING LOSS PREVENTION

## Improvements to DOD Hearing Conservation Programs Could Lead to Better Outcomes



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## Why GAO Did This Study

Exposure to hazardous noise can have negative implications for both servicemember health and readiness. Moreover, in fiscal year 2009, some of the most common impairments for veterans receiving Veterans Affairs (VA) disability benefits were hearing related, as annual payments for such conditions exceeded \$1.1 billion. To examine Department of Defense (DOD) efforts to prevent hearing loss, GAO is reporting on (1) how well the DOD and armed services identify and mitigate hazardous noise; (2) how well the military evaluates hearing conservation program performance; and (3) the status of DOD's Hearing Center of Excellence and the extent that DOD and VA are sharing information to inform this and other efforts. GAO reviewed DOD and services' policies and guidance, reviewed DOD performance data, interviewed officials and servicemembers, and conducted site visits to nine military bases.

## What GAO Recommends

GAO recommends that to improve hearing conservation programs, DOD should address issues with the type, timing, and tracking of training and education; develop an appropriate set of performance indicators; improve processes to collect and use performance data; and examine services' reviews to identify opportunities for program improvement. In reviewing a draft of this report, DOD concurred with GAO's recommendations. DOD and VA provided technical comments, which GAO incorporated as appropriate.

View [GAO-11-114](#) or [key components](#).  
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# HEARING LOSS PREVENTION

## Improvements to DOD Hearing Conservation Programs Could Lead to Better Outcomes

### What GAO Found

Each of the armed services is taking steps to monitor hazardous noise, but inconsistencies in some hearing protection strategies and limited training weaken mitigation efforts. Services monitor noise periodically, depending on the level of risk servicemembers have in being exposed to hazardous noise (for example, annually for firing ranges and flight decks, and every 5 years for administrative offices). However, they lack a reliable system for detecting changes in noise levels that may occur outside the scheduled review cycle. Although DOD requires that noise be controlled by setting exposure limits and requiring the use of hearing protection, these strategies are not consistently used. For example, servicemembers told us that they do not always wear hearing protection, citing concerns with comfort and communication. Annual hearing-related training is required for at-risk servicemembers, but services are not able to fully determine who has completed annual training, and many servicemembers told GAO that training is not necessarily well timed.

DOD's evaluation of services' hearing conservation programs has key weaknesses, but some services have taken steps to review and improve their own programs. First, DOD performance indicators are not sufficiently comprehensive. One key indicator—the rate of hearing loss among servicemembers in the hearing conservation programs—only measures program performance after hearing loss has occurred. Second, evaluation is limited by weaknesses in the processes used to capture, track, and use performance data. For example, the data may not accurately capture the number of servicemembers enrolled in the respective programs—a number required to calculate compliance rate. Third, audiologists, and other key stakeholders do not, on some bases GAO visited, routinely coordinate to share and evaluate hearing loss data to identify and mitigate noise hazards. Individual services have, at times, conducted reviews of their own programs and made some improvements. For example, once the Army decided that soldiers would not be deployed if the individual had not completed a required hearing test, the number of hearing tests rose significantly.

DOD has developed, though not yet finalized, a plan for a Hearing Center of Excellence to improve hearing loss prevention and treatment as well as a plan for its registry to track and share information with VA on injured military personnel and veterans. Neither Congress nor the DOD set a date for when planning should be formally approved to implement the center, but a key DOD official estimated that plans may receive final DOD approval in the near future. In the meantime, an interim director for the center has begun to lay the groundwork for implementation of both the center and the registry. While data sharing between DOD and VA has been very limited to date, military and VA officials said the registry should ultimately facilitate sharing and development of best practices.

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Abbreviations

AFCESA	Air Force Civil Engineering Support Agency
DOD	Department of Defense
DOEHRS	Defense Occupational and Environmental Health Readiness System
HCP	hearing conservation program
IOM	Institute of Medicine
NAS	Naval Audit Service
OSHA	Occupational Safety and Health Administration
STS	significant threshold shift
VA	U.S. Department of Veterans Affairs

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**United States Government Accountability Office**  
**Washington, DC 20548**

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January 31, 2011

The Honorable Carl Levin  
Chairman  
The Honorable John McCain  
Ranking Member  
Committee on Armed Services  
United States Senate

The Honorable Howard P. "Buck" McKeon  
Chairman  
The Honorable Adam Smith  
Ranking Member  
Committee on Armed Services  
House of Representatives

Military service can expose soldiers to hazardous levels of noise, ranging from gunfire to military aircraft, all of which can lead to a loss or damage in hearing if protective equipment and measures to reduce exposure are not employed in advance. Well before retirement, such damage can reduce servicemembers' ability to communicate and affect the quality of their professional and personal lives. Moreover, it can create additional costs to the government and taxpayers by decreasing troop readiness and increasing the need for medical services and disability compensation. To protect servicemembers' hearing, the Department of Defense (DOD) and the armed services have established hearing conservation policies and programs. Nevertheless, U.S. Department of Veterans Affairs (VA) has reported that tinnitus (ringing in the ears) and hearing loss remain some of the most common service-connected disabilities. Approximately \$1.1 billion in disability compensation was paid out for these two conditions in fiscal year 2009.

Many have raised concerns about the need to protect servicemembers' hearing, including DOD, VA, Congress, and national organizations dedicated to protecting hearing. Such concern on hearing-related disabilities prompted Congress in October 2008 to require that DOD establish a center dedicated to the prevention and rehabilitation of servicemembers and veterans with auditory disabilities. Congress has mandated GAO to review DOD's hearing protection efforts and report on

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the status of the hearing center.<sup>1</sup> Specifically, to respond to this mandate and gain insight into DOD's efforts to prevent hearing loss, we determined (1) how well the DOD and armed services identify and mitigate hazardous noise; (2) how well the military evaluates hearing conservation program performance; and (3) the status of DOD's Hearing Center of Excellence and the extent to which DOD and VA are sharing information to inform this undertaking and generally protect servicemembers. To address objectives one and two, we reviewed DOD and armed services hearing conservation policies and guidance, reviewed other federal agencies that set standards and policy for hearing conservation, and interviewed cognizant military officers from DOD, Army, Navy, Air Force, and Marines, as well as stakeholders. We reviewed past evaluations of DOD hearing conservation programs, including a study conducted by the Institute of Medicine (IOM). We conducted site visits to nine military installations. During these site visits, we interviewed senior officials, audiologists, industrial hygienists, servicemembers, safety officers, and other officials who assess, measure, and mitigate occupational health hazards. We selected these site visits based on a number of factors, including the military branch, size of the installation, presence of different types of hazardous noise, and geographic location. To determine how DOD and the armed services monitor program performance, we also interviewed cognizant officials, reviewed hearing conservation performance measures and program data and reviewed documentation for DOD's Defense Occupational and Environmental Health Readiness System (DOEHRS), and analyzed key system reports for each of the armed services. To address objective three, we interviewed the DOD Hearing Center of Excellence program manager, the interim director of the Hearing Center of Excellence, as well as representatives from the VA involved with the center's development.

We conducted our overall performance audit from November 2009 to January 2011 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient and appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. For additional information on our scope and methodology, see appendix I.

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<sup>1</sup>S. Rept. No. 111-35, at 146, accompanying the National Defense Authorization Act for Fiscal Year 2010, Pub. L. No. 111-84 (Oct. 28, 2009).

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## Background

Noise is one of the most common occupational health hazards faced by military servicemembers. Servicemembers may be exposed to high-intensity noise of various types during their training and when performing general job duties or combat operations. Without proper protection, this exposure can cause or contribute to tinnitus and hearing loss. The effects of tinnitus, a ringing in the ears significantly associated with unprotected exposure to hazardous noise and noise-induced hearing loss, can range from minor to debilitating and can be permanent. Noise-induced hearing loss, and occasionally tinnitus, can be rehabilitated with a hearing aid, but they are permanent disabilities.

After leaving the military, servicemembers who sustain tinnitus or hearing loss during service may qualify for compensation from the VA. VA's disability compensation program compensates veterans for the average loss in civilian earning capacity that results from injuries or diseases incurred or aggravated during military service, regardless of current employment status or income. In fiscal year 2009, VA compensated 1.2 million claims for veterans with either tinnitus or hearing loss injuries,<sup>2</sup> representing an annual federal expenditure exceeding \$1.1 billion for disability compensation payments.<sup>3</sup> In 2005, auditory impairments, which include hearing loss and tinnitus, became the most common service-connected disabilities compensated by VA. Since 2005, VA has reported that the numbers of veterans who have begun receiving compensation each year for these disabilities have continued to grow, contributing to VA's increasing annual expenditure on disability claims (see fig. 1).

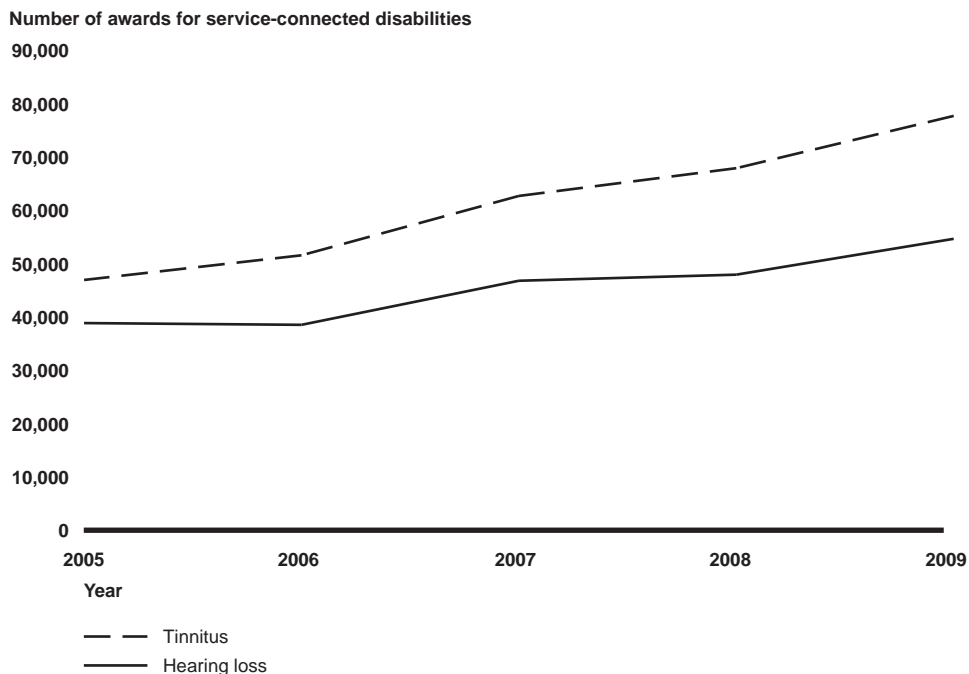
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<sup>2</sup>VA, *Veterans Benefits Administration Annual Benefits Report Fiscal Year 2009* (Washington, D.C.) p. 5.

<sup>3</sup>VA, Rehabilitation Research and Development, National Center for Rehabilitative Auditory Research, *Annual Report for Calendar Year 2009* (Portland, Ore.) p. 88.



**Figure 1: Growth in Numbers of New VA Disability Compensation Awards to Veterans for Hearing Loss and Tinnitus for Fiscal Years 2005 through 2009**



Source: Veterans Benefit Administration annual benefits reports, fiscal years 2005 through 2009.

Beyond the cash benefits VA provides to veterans with hearing-related disabilities, there are other expenditures by both VA and DOD to rehabilitate, treat, or correct auditory injuries. For example, VA purchased almost 382,000 hearing assistive devices in fiscal year 2008, for an expenditure of approximately \$154 million.<sup>4</sup>

Both noise-induced hearing loss and noise-induced tinnitus may be avoided through auditory injury prevention, referred to as hearing conservation. Due to the introduction of the jet engine to military environments and the number of World War II veterans who sustained hearing loss during combat, hearing conservation became a concern of the armed services in the late 1940s. According to a recent IOM study, in 1948, the armed services began developing hearing conservation programs and,

<sup>4</sup>Dr. Lucille B. Beck, Chief Consultant, Rehabilitation Services and Director of Audiology, VA, "Update on Audiology," p. 15.

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in 1978, DOD issued the first departmentwide hearing conservation directive that provided guidelines to unify the implementation and goals of hearing conservation programs (HCP) throughout the armed services.<sup>5</sup>

According to DOD policy, the goal of hearing conservation is to protect all servicemembers and other personnel from hearing loss resulting from occupational noise exposure. The policy states that each armed service is to implement a hearing conservation program, including the Air Force, the Army, the Marine Corps, and the Navy, and that these programs are to be implemented when personnel are exposed to a certain level of noise.<sup>6</sup> All the services have policies that include the enrollment of personnel working in areas with noise at or above levels that can be hazardous when performing their general job duties. Though military operations are not subject to federal civilian health and safety regulations, DOD's hearing conservation instructions direct that the armed services' HCPs comply with federal standards whenever practicable.<sup>7</sup>

DOD policy incorporates the following key elements into its hearing conservation programs: noise hazard identification, safety signs and labels, noise mitigation, education and training, audiometric surveillance, and program evaluation (see table 1).<sup>8</sup> Each armed service branch must submit a written plan to DOD that outlines its program, including the strategies for implementing these elements.

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<sup>5</sup>The IOM study also stated that in 1948, the Air Force was the first armed services to issue hearing conservation regulations, with the Navy following suit in 1955 and the Army in 1956. See Larry E. Humes, Lois M. Joellenbeck, and Jane S. Durch, editors, Committee on Noise-Induced Hearing Loss and Tinnitus Associated with Military Service from World War II to the Present, *Noise and Military Service: Implications for Hearing Loss and Tinnitus* (Washington, D.C.: The National Academies Press, 2005).

<sup>6</sup>DOD defines this threshold level of noise as (1) continuous or intermittent noise that has an 8-hour time-weighted average noise level of 85 decibels or above, (2) impulse noise with sound pressure levels of 140 decibels or greater, and (3) "upersonic and ultrasonic acoustic radiation" determined to be hazardous (DODI 6055.12, 6.2).

<sup>7</sup>DODI 6055.1, E3.4.2.1.

<sup>8</sup>DOD's hearing conservation program instruction also includes several other elements that we did not focus our review upon, such as access to information, training material, and records and personnel assignments.

**Table 1: Key Elements of DOD Hearing Conservation Programs**

Element	Purpose
Noise hazard identification	Measure noise levels in all potentially hazardous noise work areas, evaluate and prioritize the risk in those areas, and keep an inventory of hazardous noise areas.
Safety signs and labels	Use signs to identify entrances to and boundaries of hazardous noise areas and labels to designate equipment that can produce hazardous noise.
Noise mitigation	Eliminate exposure to hazardous noise by implementing engineering and administrative controls and by providing and requiring the use of hearing protection devices.
Education and training	Inform personnel of the effects of noise on hearing, the ability of hearing protectors to reduce exposure to noise, the purpose of hearing protection, the purpose of audiometric testing, the proper use of hearing protection and the actions to be taken for failure to wear the hearing protection.
Audiometric surveillance	Evaluate hearing levels of personnel through audiometric testing and maintain records of all audiometric testing in a hearing conservation database and in the individual's health record, along with noise exposure information.
Program evaluation	Use the information stored in the hearing conservation database to annually evaluate the hearing conservation program's effectiveness based on the percent of enrolled personnel who received annual audiograms and on the prevalence of significant threshold shifts (STS). <sup>a</sup>

Source: DOD and service-level guidance.

<sup>a</sup>An STS is a change in hearing, in comparison to a baseline audiogram, of an average of 10 decibels or more in either ear at 2,000 Hz, 3,000 Hz, and 4,000 Hz.

DOD instructions require services to reduce noise to safer levels, where possible, using three strategies: engineering controls, hearing protection, and administrative controls. DOD policy requires that engineering controls be the primary means of eliminating exposure of personnel to potentially hazardous noise. To implement engineering controls, services should design their work environment to reduce noise below hazardous levels and purchase equipment with the lower sound emissions. The use of hearing protection is considered an interim measure, but if services determine that engineering controls are not possible, DOD policy allows them to use personal hearing protection as a permanent measure to mitigate noise. Furthermore, if additional protection is needed, administrative controls, such as modifying work schedules or procedures should be used to limit exposure to hazardous noise.

In recent years, studies have addressed hearing loss and tinnitus in the military. For example, in 2002, Congress directed that VA contract with the National Academy of Sciences to conduct a study on noise exposure with

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respect to hearing loss and tinnitus in the military.<sup>9</sup> The National Academies' IOM study examined the sources of hazardous noise exposure in the military, levels of noise exposure necessary to cause hearing loss or tinnitus, the course of hearing loss following noise exposure, risk factors, and compliance by the military services with requirements for audiometric testing and the adequacy of their hearing conservation programs.<sup>10</sup> The study found that military hearing conservation programs were not adequate to protect servicemembers' hearing. This conclusion was supported by findings that the annual audiometric testing of servicemembers enrolled in hearing conservation programs showed that 10 percent to 18 percent had a significant shift in their threshold, which was estimated to be two to five times higher than rates considered appropriate in industrial hearing conservation programs. The study also found that the military programs may not perform the required annual audiometric testing on all servicemembers exposed to hazardous noise and that overall testing was not sufficient to evaluate changes in hearing associated with military service for the majority of servicemembers. Furthermore, while information was limited, the study noted that a high proportion of servicemembers (sometimes up to 50 percent in certain situations) may not be wearing hearing protection when needed.

Additionally, in fiscal year 2008, the Marine Corps identified hearing loss among personnel as a risk in its annual Risk and Opportunities Assessment and, in following up, requested that the Naval Audit Service (NAS) conduct a review of its hearing conservation program. The objective of the NAS audit was to determine whether the management and implementation of the Marine Corps HCP is effective in protecting servicemembers' hearing.<sup>11</sup>

In response to serious auditory injuries incurred by servicemembers associated with Operation Iraqi Freedom and Operation Enduring Freedom, Congress mandated in October 2008 that DOD create a center of excellence in the prevention, diagnosis, mitigation, treatment, and

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<sup>9</sup>Veterans Benefits Act of 2002, Pub. L. No. 107-330, § 104, 116 Stat. 2822 (2002).

<sup>10</sup>Humes, Joellenbeck, and Durch, "Noise and Military Service: Implications for Hearing Loss and Tinnitus."

<sup>11</sup> U. S. Department of the Navy, Naval Audit Service, *Management and Implementation of the Marine Corps Hearing Conservation Program* (Jan. 14, 2011).

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rehabilitation of hearing loss and auditory system injury.<sup>12</sup> A key responsibility of the Hearing Center of Excellence is to create an electronic registry that tracks the diagnosis, treatment, and follow-up for each case of hearing loss and auditory system injury incurred by servicemembers on active duty. The center is required to inform VA when any of these servicemembers transition from the armed services to VA to help ensure the coordination and provision of auditory system rehabilitative services.

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## Services Are Employing Strategies to Identify and Mitigate Hazardous Noise, but Inconsistent Practices and Limited Training Weaken Their Efforts

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### Services Use a Risk-Based Approach to Monitor Sites for Hazardous Noise Levels, but Lack Reliable Notification for Interim Changes

According to services' policies, the services monitor noise levels at various sites on a periodic basis according to the level of risk these sites pose to servicemembers, but they do not provide guidance for a reliable notification system for changes to site conditions that may occur in the interim. DOD policy specifically requires the services to measure noise levels, and we found that hearing conservation personnel at each of the sites we visited use noise surveys to assess the level at which specific work and training areas are likely to expose servicemembers to hazardous noise. At the sites we visited, such site noise is subsequently monitored through periodic surveys, scheduled according to their respective level of risk. For example, at sites we visited, high-risk areas, such as firing ranges and flight decks, thought to pose the greatest chance of exposure to hazardous noise are surveyed annually. Medium risk areas, such as flight hangars and light industrial areas can be surveyed every 2 years; low-risk

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<sup>12</sup>Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, Pub. L. No. 110-417, Div. A. tit. VII, § 721, 122 Stat. 4506 (2008).

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areas, such as administrative offices, can be surveyed up to every 5 years, depending on the service's policy. For example, Navy officials told us they conduct noise surveys every 4 years for their administrative offices, whereas Army officials conduct them every 5 years.

According to the policies from most services, responsibility for measuring and reporting noise levels is delegated to experts in noise abatement, such as industrial hygienists, who employ a number of measuring devices, such as sound level meters and noise dosimeters, to determine how loud the noise is and how long servicemembers are exposed (see fig. 2 for examples of measuring devices).<sup>13</sup> At the sites we visited, the results of the measurements were recorded on noise survey forms that were used as the basis for reports that were sent to safety offices, individual military units, work sites and base leadership, depending on local base procedures.

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<sup>13</sup> A sound level meter is the basic instrument for investigating noise levels and can be used to determine an employee's noise dose whenever use of a noise dosimeter is unavailable or inappropriate. Sound level meters identify and evaluate individual noise sources for abatement purposes, aid in determining the feasibility of engineering controls for individual noise sources, and evaluate hearing protectors. A dosimeter is worn by individuals in order to determine noise doses during a specified time period.

**Figure 2: Example of a Noise Dosimeter and Sound Level Meter**



Source: GAO.

At the sites we visited, while the frequency at which the services monitor site noise depended on an initial determination of the site's risk level, it did not appear that changes to a site that alter its noise levels are always promptly and systematically reported. DOD policy requires that noise be measured within 30 days of any change in operations affecting noise levels; however, several noise abatement experts at the sites we visited told us they are not always informed of changes in noise. Instead, they more often encounter the changes in noise levels during a scheduled noise survey. Some of these experts suggested that servicemembers could be exposed to more hazardous noise levels for a prolonged period of time if no one informs them of changes to noise levels between scheduled surveys; some of which are conducted only once every several years.

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## Services Employ Strategies to Mitigate Noise, but Some Practices Are Inconsistent

In accordance with DOD policy for those in the hearing conservation program, the services employ a number of strategies to control the amount of exposure to hazardous noise. These strategies include engineering noise to safer levels, setting time limits on noise exposure, and requiring the use of protective equipment; however they are not consistently practiced.

### Engineering Controls

Mitigating noise thorough engineering controls can be carried out by improving noise reduction technology, building barriers to deflect noise, and through procurement of quieter equipment and technology. Under DOD policy, the services are required to use engineering controls as the primary means of eliminating personnel exposure to potentially hazardous noise. During our site visits, we observed examples of how the services have implemented such controls. For example, at an Air Force base maintenance shop we visited, we observed a “muff” being used to reduce the noise for a newly acquired water drill. At a Navy base we visited, a separate building was constructed apart from the maintenance shop to house a loud piece of equipment to reduce servicemembers’ noise exposure. Services are also required to review equipment being considered for procurement to determine if they produce hazardous noise and consider methods for limiting the noise when technologically and economically feasible.<sup>14</sup> In the Air Force, when designing weapons and facilities such as firing ranges, procurement decisions are not made at the base level, but are decided centrally by the Air Force Civil Engineering Support Agency (AFCESA). AFCESA attempts to strike a balance between operational effectiveness and worker protection when making procurement decisions. During this decision-making process, bioenvironmental engineers and other staff are involved in examining safety, fire, and occupational health issues—including hazardous noise. For example, AFCESA’s involvement in the procurement of the new F-22 fighter jet led to considerations in how bases could redesign hangars to reduce the impact of noise from this plane. Officials from the Army Office of the Surgeon General said noise abatement experts are usually included in the procurement process for weapons systems, though not necessarily for non-weapon system procurements. Also several Navy officers from the Office of the Surgeon General told us the Navy has recently started to include industrial hygienists in the procurement of weapon systems though, to date, this has involved only one such procurement. Navy

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<sup>14</sup>Navy policy states that it is much less costly to eliminate potential noise problems in the design or procurement stage for new processes, equipment, and facilities than it is to make retrofits or modifications after the fact.



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officials also added they are attempting to update their own procurement guidance to include noise abatement experts. However, at a number of sites we visited, several noise abatement experts told us they are not involved in the procurement process.

## Setting Time Limits

In accordance with DOD policy, all the services have established guidance detailing how long servicemembers can be exposed to certain hazardous noise levels without the use of hearing protection—also known as administrative controls. For example, the DOD allows servicemembers to be exposed to 85 decibels of noise, a more stringent threshold than the Occupational Safety and Health Administration (OSHA) considers hazardous, for up to 8 hours without the use of hearing protection equipment.<sup>15</sup> However, according to a number of hearing conservation personnel, controlling the amount of time that servicemembers are exposed to noise is often more practical for military personnel who work in civilian or industrial style, non-military operations. By comparison, for servicemembers engaging in military operations, abiding by specific time limits is more difficult because their duties may require them to stay at their station beyond recommended limits. For example, hearing conservation personnel aboard an aircraft carrier we visited told us that personnel who work on the flight deck have flight operations lasting as long as 16 hours. Reflecting a similar point, an audiologist told us that controlling the amount of time Marines are exposed to hazardous noise in battle is unrealistic, as Marines cannot stop fighting because they have exceeded their allotted exposure time to noise.

## Personal Protective Equipment

DOD policy requires servicemembers to wear personal protective equipment, such as earplugs, when engineering controls are not sufficient to reduce noise levels.<sup>16</sup> Based on our interviews with servicemembers and audiologists, we found that the services largely make such equipment available. More specifically, some servicemembers at the sites we visited told us they were able to obtain hearing protection primarily from their units or from hearing testing centers and from work or training areas (see fig. 3 for examples of hearing protection devices). However, according to several hearing conservation personnel we spoke with, some of the

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<sup>15</sup>Pursuant to OSHA regulations at 29 C.F.R. § 1910.95(b)(2), the minimum level at which noise protection measures must be taken is 90 decibels.

<sup>16</sup>Hearing protection devices are expected to reduce noise to safer levels. Depending on the intensity of the noise, services will require two forms, or double, hearing protection being worn at the same time, to further reduce noise.

services do not have an up-to-date list of approved equipment that units can choose from when purchasing hearing protection. They also said purchasers have little to no experience with hearing protection and we were told of a unit that, as a result, had purchased personal protective equipment without determining whether it would be effective. Hearing conservation personnel at one of the Army bases we visited recounted a story where one unit deployed using untested hearing protection that was later rejected. In addition, senior DOD officials also told us that some servicemembers bought their own hearing protection equipment that was below the required standards. Finally, we observed that servicemembers themselves are not necessarily using equipment provided to them or are not using the hearing protection equipment properly.

**Figure 3: Examples of Hearing Protection Devices**



Source: GAO.

To assure that the correct personal protective equipment is used, DOD's policy requires that all hazardous noise areas and industrial and military equipment have signs or labels that identify them as producing hazardous noise. The signs and labels are also expected to communicate the level of protective devices (i.e., single or double hearing protection) that should be worn to prevent hearing loss while working in or around the hazardous noise. However, at many of the sites we visited, we observed signs and labels indicating hazardous noise equipment or areas, although not all of the signs included the protective measures required. (See fig. 4 for an example of a hazardous noise sign that does not include the level of hearing protection needed.) In some limited instances, a sign was not posted in an area that the safety officer guiding our walk-through noted should have had proper signage.

**Figure 4: Example of a Hazardous Noise Sign That Does Not Include the Level of Hearing Protection Equipment Needed**



Source: GAO.

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Also, some of the servicemembers at the sites we visited maintained that enforcement of the wearing of protective equipment is limited. These servicemembers said their superiors did not consistently check for equipment usage, and there is little to no discipline for members who are not using them. Some services also placed the responsibility for reminding their members about the importance of hearing protection with servicemembers who are often of lower rank and thus lack the authority to enforce adherence to the requirements. Army Hearing Program personnel described to us a program that assigned specific soldiers to disseminate information on hearing conservation issues and remind individuals to wear hearing protection. However, according to some Army Hearing Program staff these assigned soldiers were of low-rank with limited authority to ensure their peers and superior officers were educated on hearing conservation or wore appropriate hearing protective equipment.

During our interviews with DOD officials and servicemembers, we heard that in some cases, servicemembers do not wear required hearing protection. During our site visits, many servicemembers expressed a number of reasons why they chose not to wear the required hearing protection. Some servicemembers said the protective equipment was uncomfortable. At the sites we visited we spoke with a number of servicemembers working on a flight line in close proximity to fighter jets who are required to wear double hearing protection. While they were generally aware that they were required to wear double protection, each was wearing single protection and many cited comfort as a reason for their non-compliance. (See fig. 5 for an example of the proximity of flight line personnel to jet airplanes.) At other locations we visited, servicemembers cited the impact of hearing protection on communication. They said that the protection can interfere with the need to communicate with their colleagues and to hear orders from superiors. Still others said they perceived that wearing hearing protection in combat can put them in harm's way because they cannot hear an enemy approach or determine where enemy gunfire is coming from. Finally, many servicemembers expressed the view that hearing loss is part of the military experience and many accepted this as a fact of a military career. For those that used hearing protection equipment, we heard of a number of instances where hearing protection equipment was not worn properly. Across many of the military sites we visited, servicemembers told us of hearing protection either falling out of their ears or getting dirty to the point of being unsanitary to wear.

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**Figure 5: Example of the Proximity of Flight Line Personnel to Military Aircraft**



Source: GAO.

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## Educating Servicemembers on Hearing Conservation Is Not Necessarily Tracked or Well Timed

In accordance with DOD policy for the armed services' hearing conservation programs, participating servicemembers should be educated and trained annually with regard to hearing conservation requirements. Per DOD policy, servicemembers should be educated on topics such as the effects of noise on hearing and the purpose of hearing protection. The policy allows services to design their own specific training. Among the sites we visited, servicemembers told us they received education on hearing conservation through a variety of training methods, including Safety Stand Downs, videos, posters, and supervisor initiatives.<sup>17</sup>

Although services have a number of training options for educating servicemembers on hearing conservation, officials from some of the services reported they were unable to verify whether servicemembers have taken any training. For example, Army Hearing Program personnel

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<sup>17</sup>Safety Stand Downs focus on correcting safety deficiencies and conducting safety training that will result in changes in behavior to prevent accidents and injuries and protect property.

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noted that the Army has no method for tracking whether soldiers have received such training. Also, Navy hearing conservation personnel told us the Navy operates systems for tracking individual training activities, but servicemembers are not required to record their training in the system. However, Air Force officials require that workplace supervisors document a servicemember's annual training on hazardous noise exposures and equipment on an Air Force Record of Training form.

We also found that educating servicemembers on hearing conservation is not necessarily conducted prior to servicemembers' first exposure to hazardous noise or during hearing tests, when they are interfacing with audiologists or audiometric technicians with hearing conservation expertise. At many of the sites we visited, we were told that servicemembers, as new recruits, were given very little education on hearing conservation prior to the first time they fire weapons during basic training in these locations.<sup>18</sup> The education generally consisted of instructors telling new recruits to simply use hearing protection in their ears, but not explaining its importance or the proper technique to insert such equipment. A few servicemembers stated they were told not to wear hearing protection during training, with the justification that training should be conducted under the same conditions as combat, which does not include hearing protection. Also, at the sites we visited, a number of servicemembers added that educating new recruits on hearing conservation may be difficult during basic training because there is little time for any additional education. Despite these observations, a number of hearing conservation personnel told us that even a single exposure to hazardous noise can trigger some level of hearing loss and believe that educating new recruits on hearing conservation during basic training would help underscore the importance of hearing protection.<sup>19</sup>

Lastly, several audiologists and audiometric technicians—hearing testing personnel—at sites we visited told us there is no formal training in conjunction with the hearing examination process for those servicemembers in a hearing conservation program. Similarly, a number of servicemembers we spoke with noted that the training they receive from

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<sup>18</sup> Although not part of DOD policy, hearing conservation personnel told us servicemembers are enrolled into a hearing conservation program based on their occupation or where they work, which occurs after basic training.

<sup>19</sup> The Army has recently initiated a pilot program to incorporate hearing protection into basic training.

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hearing testing personnel primarily consists of reminding them to wear hearing protection. That stated, several hearing conservation personnel at the sites we visited told us they provided more in-depth informal training to servicemembers who fail their hearing examinations, consisting of an explanation of test results, a demonstration on the proper fitting of hearing protection, and a reminder to wear hearing protection.

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## DOD's Approach to Evaluating Hearing Conservation Has Key Weaknesses, While Some Services Have Taken Steps to Review and Improve Their Own Programs

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### DOD Lacks Adequate Performance Indicators

DOD delegates most program evaluation to the services, but lacks adequate performance indicators to proactively assess how well services are reducing hearing loss among servicemembers. At the time of our review, DOD policy required that services evaluate their hearing conservation programs on an annual basis based on two annual performance indicators both targeted for servicemembers enrolled in a hearing conservation program—(1) the percentage of servicemembers that take a required annual hearing test and (2) the rate of significant hearing loss.<sup>20</sup> Several senior service-level hearing program managers expressed concern about the adequacy of the indicators. More specifically, they told us that the current performance indicators are not sufficiently comprehensive and that the rate of significant hearing loss only provides a measure of performance after damage has occurred. In general, key officials in the services we spoke with expressed a desire for more leading indicators that could signal to program managers that targeted

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<sup>20</sup>STS or significant hearing loss occurs when there is a change in hearing threshold relative to an initial hearing test result of an average of 10 decibels.

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interventions are needed before hearing loss has occurred. Moreover, some Army officials told us that they would like to see indicators that are more closely aligned with their readiness—which is a basic measure to assess each servicemember’s ability to deploy. A senior-level DOD official told us they convened two working group sessions—which involved representatives from across the services—since spring 2010 to discuss amending existing performance indicators. According to another senior-level DOD official, additional indicators were put in place in December 2010 when DOD released its updated hearing program guidance. This guidance includes indicators designed to be more proactive in hazard evaluation and intervention prior to measurable hearing loss, such as the percentage of noise hazardous workplace characterizations completed and an index of unacceptable noise exposures. The guidance also encourages services to develop additional measures of program effectiveness.

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## Limitations in Information System Processes Hinder Program Evaluation Efforts

Program evaluation is also hindered by limitations in the processes used to capture, track, and use hearing-related performance data. DOD has multiple information systems related to its hearing conservation program, including one that tracks servicemember hearing test results and another that tracks servicemembers’ exposure to occupational noise hazards. But officials we spoke with identified limitations in the processes designed to support these systems that, collectively, compromise the reliability or usefulness of performance data that they generate.<sup>21</sup>

We found limitations in the process to identify whether hearing loss for an individual may have occurred. Typically, immediately prior to administering a hearing test, an audiometric technician will query the hearing test system to retrieve a servicemember’s prior test results, which are used as a baseline with which to establish whether a loss has occurred. However, on some occasions, prior hearing test data cannot be located in the system and must be entered manually by audiometric technicians before they administer the hearing test. For example, at one base we visited, if a servicemember did not bring their original paper examination to the test, technicians told us they would sometimes have to categorize the test as a “non-hearing conservation” hearing test or have to re-establish

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<sup>21</sup>The Defense Occupational and Environmental Health Readiness System – Hearing Conservation (DOEHRS-HC) provides the ability to conduct and track automated baseline, annual, pre- and post-deployment hearing test results. The Defense Occupational and Environmental Health Readiness System-Industrial Hygiene (DOEHRS-IH) is used to collect, maintain, and analyze hazard and exposure data.



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the baseline hearing test, making it difficult to assess whether a significant hearing loss has occurred because there would not be two comparison points. Audiometric technicians must also manually enter into the hearing test system whether a servicemember is receiving an initial or follow-up hearing test. However, Navy researchers conducting system reliability tests told us they have found anomalies in how initial and subsequent hearing tests were categorized, making it difficult to tell whether tests were given in the proper sequence. They attributed many of these problems to technicians' manual data entry errors and the lack of a consistent review process to ensure these entries are accurate, which undermine the accuracy of the test data.

We also found limitations in the process to establish that hearing loss for an individual has actually occurred. If a hearing loss is detected during an annual examination, it is generally considered temporary until the hearing loss is confirmed in at least two additional follow-up examinations.<sup>22</sup> According to DOD officials, servicemembers must appear for the follow-up examinations within 90 days of an annual test. However, we found that when servicemembers who fail their annual tests do not appear for follow-up examinations within the required period, the system will automatically count their temporary hearing loss as permanent. To the extent this occurs, the rate of permanent hearing loss could be inflated. Without a reliable rate for hearing loss, services are unable to properly assess the effectiveness of their program or properly target prevention efforts.

Finally, in reference to hearing tests, we found limitations in the process used to identify the number of servicemembers enrolled in the services' respective hearing conservation programs—which is essential to calculating the hearing test compliance rate. Because the system designed to track hearing tests does not automatically capture the number of enrollees, each service must estimate its number from other data sources. For example, Air Force hearing program enrollment information is maintained in a separate database that does not link to the hearing test system. Consequently, Air Force officials resort to using an often time-consuming manual process to tally the number of servicemembers enrolled in the hearing conservation program. Similarly, Navy and Marines officials told us that at some locations, officials must construct enrollment information from multiple sources, including paper files. Compiling

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<sup>22</sup>In the Air Force, only one follow-up examination is required to confirm that permanent hearing loss has occurred.

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enrollment numbers from multiple sources can lead to errors in calculating the compliance rate. For example, we found that the Army reported a compliance rate that exceeded 100 percent in 2007.

In reference to the system that tracks hazard exposure information—including the time, place, and amount of servicemembers' exposure to hazardous noise—we identified some limitations with the current usefulness of the system. This system is designed to track servicemembers' occupational exposure to noise and other hazards over the course of a military career. However, based on the information we received, the system is not yet fully implemented at some installations. Moreover, Army industrial hygiene officials at one installation told us that they had been trained on the system, but did not have the staff resources to upload exposure information into the system from individual files. In discussing this issue, Army officials told us that 300 new industrial hygiene personnel they expect to hire over the next 3 years will aid systems implementation. A senior-level Air Force official told us that the Air Force has fully implemented the hazard tracking system across all installations. However, Air Force industrial hygiene officials expressed concern to us about the system's capacity to generate reports in a format that provides useful performance information. More specifically, they noted that to get critical information about the hazards that exist in each Air Force work site, the new system generates a 14-page report. To overcome the system's limitations, the Air Force developed a reporting process that could produce the same information in 2 pages. A senior-level Air Force official told us it is necessary for them to upload hazard information twice daily from the new system into an existing Air Force form to get the performance information needed to effectively mitigate noise hazards on base and meet DOD requirements, respectively. Moreover, the hazard exposure tracking system is not currently integrated with the hearing test system. DOD initially designed these systems with the intent to integrate data from both systems to identify the impact of each servicemember's individual exposure to noise and other occupational hazards. Although the DOD hearing test system has been active since 1999 and the hazard exposure system was initiated in 2006, to date, these systems have not been linked. As a result, hearing conservation managers told us it is difficult to systematically analyze the causes of hearing loss and effectiveness of mitigation measures. According to DOD officials, DOD has not determined when they plan to integrate the two systems.

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## Program Stakeholders Do Not Appear to Routinely Coordinate to Evaluate Program Performance

Evaluating an installation's implementation of the hearing conservation program requires information that often resides across various departments on base. This information includes noise hazard data; steps actually taken to mitigate hazards; and hearing tests results. As indicated by DOD guidance and supported in principle by many of the stakeholders we spoke with, it is necessary for various stakeholders, including workplace supervisors, industrial hygienists, audiologists, and safety officials, to communicate and share information about potential noise hazards and hearing loss trends in order to effectively manage and evaluate the hearing conservation program. However, based on interviews with senior-level officials and our site visits, coordination does not appear to routinely occur at some bases. For example, at a Navy and Marine base we visited, industrial hygienists were responsible for identifying hazardous noise at work sites and making recommendations on how to mitigate these hazards, but they had no authority to oversee the implementation of their recommendations. Across all the services, officials, who reside in a separate department from industrial hygienists, are responsible for monitoring hearing loss and following up and enforcing industrial hygiene recommendations, but we were told on some bases these two departments rarely coordinate. At one base we visited, industrial hygiene and audiology officials had never met one another prior to our visit. However, we did document one instance of effective coordination at one Army installation, whereby an audiologist responsible for hearing testing identified an increase in hearing loss among servicemembers at a particular work site. In order to prevent further hearing loss, the audiologist shared this information with the industrial hygiene officials on base and they were able to conduct an assessment of potential noise hazards and make recommendations to mitigate these hazards.

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## Services Have Made Efforts to Review and Improve Their Own Hearing Programs

### Air Force Occupational and Environmental Health Working Group

Each service has taken some steps to review their own hearing conservation programs and identify opportunities for improvement. These include scheduled reviews of hearing loss data and hearing test audits, among other efforts.

The Air Force developed a mechanism to aid coordination across multiple departments by requiring each base to establish an Occupational and Environmental Health Working Group to review data on a wide range of health hazards and indicators. At one site we visited, the working group had members from multiple departments, including Flight Medicine, Safety, Bioenvironmental Engineering, Aerospace Physiology, Public Health, and Audiology. Members of the working group told us they review hearing loss data each month for each unit on base to determine if there

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are incidences of significant hearing loss. If significant loss is identified, the working group will conduct a site visit to determine its cause and make recommendations for noise mitigation.

#### Audit of Marine Corps Hearing Tests

After the Headquarters Marine Corps Safety Division designated hearing loss as a high risk issue for the Marines in fiscal year 2008, the Marines requested that the Naval Audit Service conduct an audit of its program. The audit focused on audiometric testing and reviewed a representative sample of Marines discharged in 2007 to determine how many had received hearing tests both at the beginning and end of their military service.<sup>23</sup> Additionally, the review included an assessment of the reliability and consistency of hearing test data and a survey of senior leadership on who is responsible for the hearing conservation program, how often the program has been evaluated, and the effectiveness of these evaluations, action plans, performance measures, and standard operating procedures. The audit found that the Marine Corps had not effectively protected the hearing of Marine Corps personnel and noted that 6,300 Marines from 2001 to 2008 had hearing loss or hearing-related injuries. NAS also found that 84 percent of the medical records of Marines who left the service in fiscal year 2007 did not have an entrance or exit audiogram within 60 days of their entry or exit from the service. The report makes several recommendations to improve the effectiveness of the Marine Corps hearing conservation program, including performing a one-time review to identify all current Marines who are due for an audiogram and establishing controls to ensure that Marines receive timely access to care for required audiograms.

#### Navy Survey of Hearing Protection Equipment aboard Aircraft Carriers

In 2005, the Naval Air Systems Command published a survey of sailors aboard six aircraft carriers assessing the extent to which hearing protection equipment was being appropriately fitted, used, and maintained.<sup>24</sup> The study included interviews with flight deck personnel on their duties, noise exposure, and their perceptions about the adequacy and comfort of their equipment. The reviewers reported that almost 50 percent of the sailors surveyed reported never wearing earplugs and only 7 percent had inserted the earplugs deeply enough to achieve the recommended protection. Moreover, they found that, for flight deck personnel studied, 79

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<sup>23</sup>U. S. Department of the Navy. Naval Audit Service, *Management and Implementation of the Marine Corps Hearing Conservation Program* (Jan. 14, 2011).

<sup>24</sup>Bjorn, V.S.; Albery, C.B.; Shilling, R.; and McKinley, R.L. (2005), "U.S. Navy Flight Deck Hearing Protection Use Trends: Survey Results."

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percent received noise reduction of only 0 to 6 decibels from their equipment—this despite working in conditions that required double hearing protection. Although helmets were found to be properly fitted for 90 percent of those surveyed, some were found to be in poor condition, or to have been shared among sailors or worn over hats or scarves. The report recommended the following actions: (1) improve the effectiveness of hearing protection equipment, including helmets, earplugs, and muffs; (2) instruct servicemembers on how to select the proper size and correctly wear and maintain hearing protective equipment; (3) make hearing protection part of the uniform; and (4) set penalties for noncompliance with the appropriate use of hearing protection.<sup>25</sup>

## Army Program Review

Concerned about the high rate of hearing-related injuries incurred during the early stages of Operation Iraqi Freedom, the Army released in 2005 a broad-based review of its hearing conservation program with regard to training, base, and combat environments.<sup>26</sup> The reviewers concluded that the Army's hearing conservation program was more suitable for industrial rather than military conditions. For example, military audiologists were serving in Iraq but their role was largely limited to evaluating—not preventing—hearing loss. In addition, the review found that the Army's readiness requirements were not specific enough to reflect the critical importance of hearing to soldiers in combat. The reviewers recommended a number of policy changes to make hearing protection policies more effective for active duty soldiers, such as requiring that, in order to meet combat readiness standards, soldiers must be up to date on their periodic hearing tests and be fitted with combat arms earplugs. Subsequently, the Army instituted a policy that soldiers who did not meet the hearing readiness standard could not be deployed. Army officials we spoke with told us that implementing this enhanced readiness standard has improved compliance with hearing tests, and have given individual soldiers and unit commanders clear accountability for taking steps to protect soldier hearing. The Army reported that audiograms increased from 168,000 in

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<sup>25</sup>Participants in this study were self-selected or were asked to participate by their commanders. Information about whether participants regularly wear hearing protection was self-reported and there was no objective measure or corroborating information used to assess this self-reported information. The information in this study is not generalizable and only applies to the six aircraft carriers that were tested. However, researchers did provide some information comparing the studied population to the overall Navy population, but did not directly assess similarities and differences on measured variables.

<sup>26</sup>Gates, Kathy (Col.) and Fallon, Eric (Lt.), "Army Hearing Conservation Program Analysis" (June 2005).

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2003 to almost 440,000 in 2006; officials attributed this increase to the new hearing readiness standard. Several Navy and Marine officials with whom we discussed the Army's hearing readiness standard expressed interest in considering a similar approach for their respective services.

The same report also recommended that military audiologists be assigned broader responsibility for hearing conservation, given their combination of medical skills, military training, and knowledge of protective and communication equipment designed for combat. In response, the Army reports that it plans to increase the number of Army military audiologists from 25 to 45. In addition, to determine whether the Army's staffing policy would effectively support military audiologists' expanded role in hearing conservation, the Army conducted a pilot study in 2008 at Fort Carson, Colorado. The Army found that an increase from one to two military audiologists at the base allowed them to spend time performing preventative services, such as training medics and noise-exposed soldiers on proper earplug use, giving briefings on hearing conservation, and inspecting noise-hazardous areas, in addition to their clinical work.<sup>27</sup> At Fort Carson we observed a military audiologist and medic meeting with soldiers on the firing range, assessing earplug fit and answering questions, as well as providing individually-fitted combat arms earplugs and distributing boxes of foam earplugs in different sizes.

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<sup>27</sup> Cleveland, Leanne (Cpt.), "Fort Carson: An Army Hearing Program Success Story," Army Department Medical Journal, April-June 2009. This study describes the effect of the addition of a second audiologist at the Army base in Fort Carson, Colo. While the study proves that the addition of the second audiologist would increase the number of servicemembers receiving testing and training, it does not provide sufficient evidence to support that an additional audiologist led to reduced hearing loss. For example, the study interprets shifts in the hearing loss and readiness rates as being directly attributable to the availability of a second audiologist, but the study does not consider other factors that could also have had effects, such as overseas deployments, changes in equipment, and changes in training.

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## Plans Are Almost Complete for Both the Hearing Center of Excellence and a System to Facilitate DOD and VA Data Sharing

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### A Plan for the Center Has Been Submitted for Final Department Approval

DOD has developed, but not yet finalized, its planning for the DOD Hearing Center of Excellence that Congress mandated in October 2008 to be established. While DOD maintains final authority on decisions for the center, it is coordinating the planning effort with the VA and has assigned the Air Force responsibility to draft plans for the center. The Air Force, in turn, designated an interim director for the center in November 2009. Subsequently, the center's interim director completed basic logistical planning, such as identifying space and budgeting for the center, along with developing proposals to hire staff and purchase equipment. He also led the internal workgroup that included representatives from all the armed services and VA that jointly developed early drafts of the concept of operation for the center to delineate its mission, goals and structure. As of September 2010, each of the armed services had reviewed the current draft. The draft was awaiting approval by the DOD Assistant Secretary of Defense of Health Affairs before it could be sent to the VA for approval. Neither Congress nor DOD set a date for when planning should be formally approved to implement the center, but a key DOD official estimated that the concept of operations may get final DOD approval in the near future.

As described by the center's interim director and Air Force Surgeon General, the current plan envisions a "hub-and-spoke concept"—the center's headquarters as the hub and selected DOD and VA regional medical centers and research sites as spokes—to integrate, facilitate, and coordinate clinical care and research for servicemembers and veterans with the latest treatment and research on hearing loss, tinnitus, and

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auditory system injury.<sup>28</sup> The Lackland Air Force Base in San Antonio, Texas, will serve as headquarters, while the regional sites have yet to be named. The director told us that the plan also describes the center as facilitating the sharing of information between DOD and VA on clinical advances related to the management and rehabilitation of hearing loss and injury. This arrangement is intended to optimize clinical care and research and avoid unnecessary duplication. DOD also has planned for possible consolidation of common support functions, such as administrative support and contract support, for all the DOD centers of excellence to help ensure operational economy and efficiency.<sup>29</sup>

Furthermore, the interim director told us that the focus of the center will be to

- research and support field testing of the best available protection and communication devices currently available, as well as developing improved hearing protection, along with better education and training on its use;
- create best practice guidelines for improving hearing outcomes after injury and explore new lines of therapy to protect or restore hearing loss or injury;
- determine how many hazardous noise exposures are too many for a servicemember and the level of hearing needed for selected jobs to facilitate appropriate job assignments;
- develop and implement better restorative and rehabilitative devices;

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<sup>28</sup>Department of Defense Medical Centers of Excellence: Hearing before the House Comm. on Armed Services, 111<sup>th</sup> Congress (2010) (statement of Lt. Gen. Charles B. Green, Surgeon General, U.S. Air Force).

<sup>29</sup>Senate Report No. 111-20, accompanying S. 1054 (providing supplemental appropriations for fiscal year 2009) directed DOD to develop a strategic plan for locating, staffing, and resourcing of medical centers of excellence to ensure they can provide “the highest quality of care, treatment and utilization of research funds for servicemembers who are suffering wounds from war.” As of late 2010, DOD had drafted but not finalized its strategic plan to respond to the Senate report. The medical centers of excellence currently include: the Hearing Center of Excellence (HCE), the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE), the Vision Center of Excellence (VCE), and the Extremity Injury and Amputation Center of Excellence (EACE).



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- promote standards for implementing hearing awareness and treatment into medical air evacuations for injured troops; and
  - collaborate with academic centers and industry in all these pursuits to mitigate or restore hearing loss.

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### Data Sharing between DOD and VA Is Expected to Increase with Implementation of a New Electronic System

While attempts have been made by DOD and VA to share data, officials from both departments told us that a new data sharing system is needed so that sufficient information is available to address hearing injuries and loss, such as assessing the effectiveness of the DOD and armed service hearing conservation programs, providing and assessing treatment, and making disability compensation decisions.<sup>30</sup> A recent data sharing experience between the two departments demonstrates some of the current weaknesses that may be resolved by the pending implementation of a new data system. In January 2010, VA responded to the hearing center's interim director's request for data to help evaluate the scope and rate of hearing loss specific to each service. VA was able to provide much of the information requested, such as the number of new VA approved claims for hearing loss and tinnitus grouped by each military branch of service and the disability rating,<sup>31</sup> for each year from 2004 through 2009. However, VA's system, developed to process claims and make disability payments, was not able to provide the other data requested in a format to meet DOD's needs for information on all claimants with hearing loss, such as date of separation from the military, period of military service, and military job. Without this additional information, the center's interim director reported to us that he could not sufficiently evaluate the military's hearing conservation programs, in part, because he could not determine the rate or trends of unique claims that could be attributable to the current conflict, specific at-risk locations or duties, or prevention efforts.

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<sup>30</sup>DOD and VA are required to develop and implement electronic health record systems and to accelerate the exchange of health care information between the departments. National Defense Authorization Act for Fiscal Year 2008, Pub. L. No. 110-181, § 1635, 122 Stat. 460 (2008). According to a recent GAO report, the departments are now exchanging pharmacy and drug allergy data on patients. For more information on their progress, see GAO, *Electronic Health Records: DOD's and VA's Sharing of Information Could Benefit from Improved Management*, [GAO-09-268](#) (Washington, D.C.: Jan. 28, 2009).

<sup>31</sup>After VA determines that a claimed disability is related to a veteran's military service, VA assigns a percentage rating to the disability that corresponds to the disability's severity. The ratings range from 0 percent to 100 percent and are assigned in increments of 10 percent.

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Although not yet finished, the plan for a comprehensive “registry”—for tracking and exchanging data between DOD and the VA on hearing loss, injury, treatment, and outcomes—is close to completion. While the concept of operations for the registry was initially expected to be developed for final review by the Assistant Secretary of Defense by July 2010, it was still under preliminary review by the armed services and the VA as of late 2010. According to the center’s interim director and a working group member, the development of the registry’s plan will be facilitated by borrowing from the design of the Vision Center of Excellence’s registry, such as using some of the same data fields and data sources for both registries. The interim director also told us that the hearing center’s registry would use data from the existing DOD and VA systems. Pending DOD approval of the registry plan, the interim director anticipates launching a pilot registry in the summer of 2012.

A key DOD official, armed services officials, and VA officials told us they expect the registry to provide a wealth of information to assess techniques for hearing protection and to develop best practices for treatment of those with hearing loss and injury. They expect the registry data to contain information on hearing loss and injury incurred during active duty, by virtue of tracking servicemembers’ injuries, interventions, and outcomes. According to the center’s interim director, this information will enable the armed services to better assess their hearing conservation programs, hearing protective efforts, therapies and procedures for auditory injury, and rehabilitation. The center’s efforts could, he noted, reduce hearing impairments and with it, the cost of VA compensation for hearing loss.

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### The Center’s Interim Director Has Been Laying the Groundwork to Facilitate the Implementation of the Center and Data System

In preparation for implementation, the center’s interim director has taken a number of steps to build alliances with academic institutions to address prevention, clinical care, rehabilitation, and research gaps. For example, to establish visibility for the center and build relationships with academic institutions, the director has contacted the Deafness Research Foundation, which has an alliance of 10 laboratories that conduct stem cell, metabolic, and other types of restoration research for hearing injuries and loss. According to the center’s interim director, this alliance is needed because DOD and VA lack resources and expertise in this area. In February 2010, the interim director facilitated a symposium of academics and officials from DOD and VA on addressing war fighter injuries. The group identified 23 relevant research projects and several areas of focus for the center’s research.

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Additional steps taken to prioritize and facilitate research on prevention and treatment include (1) spearheading the formulation of a white paper to identify gaps and propose solutions to coordinate and link research efforts across DOD and VA hearing research labs and clinical sites and (2) initiating discussions to create within DOD a centralized and independent Institutional Review Board to be linked with VA's centralized Institutional Review Board. The center's interim director envisions that such a board would not only meet the standard research requirement for an independent body to protect patients and patient data, but would also shorten the time it takes for any of DOD's Centers of Excellence to get board approval for research and access to data.

With regard to the data sharing network that includes the registry, the center's interim director has taken a number of steps to develop its capacity. To move forward with data sharing, he has requested a military-wide health system certification of auditory software that is needed to allow DOD and VA to collect and share hearing test results. The hearing center registry has also been developed so that it can be linked with other registries and centers, to help integrate servicemember data on hearing with other sensory deficits, as well as traumatic brain injury. He has also assisted with the development of a module to include auditory data collection in DOD's front-line medical treatment information registry.<sup>32</sup>

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## Conclusions

Good hearing is critical to a servicemember's performance and well-being, whether in combat or in carrying out peaceful operations. The U.S. military system has, in recent years, undertaken measures to preserve the hearing of military personnel and alter the assumption that military duty must inevitably lead to a loss in hearing capacity. Nevertheless, hearing loss and tinnitus remain conditions that most often require disability compensation for veterans. Yet both are largely preventable.

The inconsistencies that we found in the various military strategies for hearing protection and the lack of good monitoring and oversight suggests that these programs are not realizing their full potential. The fact that new servicemembers do not necessarily receive instruction on using protective equipment before they are exposed to hazardous noise in basic training, for example, undermines the first stage of any defense, which is

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<sup>32</sup>DOD uses its Joint Theater Trauma System and Joint Theater Trauma Registry to collect data and improve the outcomes of soldiers injured on the battlefield.

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prevention. Moreover, servicemembers enrolled in a hearing protection program that do not necessarily receive more education and training when they appear for their periodic exams represent another lost opportunity for hearing loss prevention. Aside from the lack of more thorough and carefully timed training programs, the services and DOD have no uniform system for tracking who has received training on hearing loss prevention. The services and DOD must ensure that service personnel are cognizant of the immediate and long term risks to hearing posed by exposure to hazardous noise.

In terms of strategy, DOD itself is not in a position to assess the adequacy of the programs and practices it now requires of the services for hearing preservation without a full set of performance indicators. Additionally, without more reliable data and reporting capability, and an integrated system of records that relate hearing injuries to work sites, DOD will further lack the ability to approach the problem of hearing loss more strategically—by capitalizing on areas of success and targeting areas of weakness.

While each of the services has made some effort to review and improve its hearing loss prevention practices, weaknesses remain in DOD efforts to identify and mitigate hazardous noise. Some of these individual initiatives, if expanded across each of the services, likely hold promise for addressing these issues. Without efforts to expand these initiatives, new insights and improvements could be lost—to the detriment of the services and servicemembers.

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## Recommendations for Executive Action

To position DOD and the services to better protect servicemembers from hearing loss, we recommend that the Under Secretary for Personnel and Readiness work with the Assistant Secretary for Health Affairs and take the following four actions to ensure that:

- DOD and the services improve upon the type, timing, and tracking of training and education provided to servicemembers on hearing protection, by providing information that is more comprehensive and training that is more frequent and possibly earlier in servicemembers' careers.
- DOD work with the services to develop an appropriate set of performance indicators that assess how well services are reducing hearing loss among servicemembers.

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- DOD and the services address limitations in the processes used to capture, track, and use performance data. This effort should address issues with data reliability, data entry, reporting capability, and integration across relevant databases.
  - DOD work with the services to examine the appropriateness and feasibility of expanding those service-level initiatives that hold promise of improving—on a DOD-wide basis—the military hearing conservation programs. Particular attention should be focused on those efforts that already appear to have either increased compliance with program requirements or have demonstrated the potential to reduce hearing loss among servicemembers, such as establishing hearing loss as a readiness issue, improving the comfort and design of hearing protection, and including noise experts more consistently in the procurement process.

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## Agency Comments and Our Evaluation

We provided a draft of this report to DOD and VA for review and comment. DOD provided written comments and agreed with our recommendations. DOD's comments have been reproduced in appendix II. VA did not provide formal written comments, but both DOD and VA submitted technical changes to the draft of the report, which we incorporated into the report as appropriate.

In its comments, DOD stated the agency's ongoing and planned actions in response to our recommendations. Specifically, to improve upon the type, timing and tracking of hearing conservation training provided to servicemembers, DOD plans to monitor the progress of the services in their efforts to implement improvements, encourage the sharing of lessons learned, and standardize improvements across services as appropriate. DOD agreed with our recommendation to more proactively assess how well services are reducing servicemembers' hearing loss. As noted in our report, in December 2010, DOD issued updated guidance that included new performance indicators designed to be more proactive in hazard evaluation and intervention prior to measurable hearing loss. The services also plan to review these indicators and develop additional indicators as needed. DOD also stated that it plans to address limitations in the processes used to capture, track, and use performance data. In addition, DOD agreed to work with the services to examine the appropriateness and feasibility of expanding DOD-wide those service-level initiatives that hold promise of improving the military hearing conservation programs. To this end, DOD stated that it will continue to use its annual Safety and Occupational Health In-Progress Review and the DOD Hearing Conservation Work Group as mechanisms of sharing service-level improvement initiatives. Our review of the department's new guidance and

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its planned actions indicate that DOD is taking steps in the right direction. If the department follows through with its efforts, we believe that it will be responsive to our recommendations.

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We are sending copies of this report to the Secretaries of Defense and Veterans Affairs, interested congressional committees, and other interested parties. The report also is available at no charge on the GAO Web site at <http://www.gao.gov>.

Please contact me on (202) 512-7215 if you or your staff have any questions about this report. Contact point for our offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report are listed in appendix III.



Daniel Bertoni  
Director, Education, Workforce,  
and Income Security Issues

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# Appendix I: Objectives, Scope, and Methodology

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To address the objectives of this study, we used a variety of methods including:

- reviewed professional journal articles and studies on audiology, military audiology, and hearing conservation;
- researched relevant federal laws, regulations, standards, and Department of Defense (DOD) and armed services' guidance;
- interviewed 12 military and civilian audiologists, 5 audiology technicians, 30 representatives of professions who assess, measure, and mitigate occupational health hazards such as industrial hygienists and safety officials, and 123 servicemembers across each of the armed services; and
- interviewed senior-level officials from DOD, Veterans' Affairs (VA), and the armed services, including the Army, the Navy, the Air Force and the Marines. We also conducted informational interviews with officials at the National Institute of Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), and the Institute of Medicine.

To review how well the services identify and mitigate hazardous noise and evaluate their hearing conservation programs, we visited nine military installations across the country—with at least two locations for each of the armed services, to review hearing conservation activities and interviewed officials both responsible for and participating in each base's hearing conservation program. (See table 2.) We selected sites to visit based on the size of the installation, the presence of hazardous noise, and geographic location. During our site visits, we met with senior officials from the installation and public health commands and interviewed audiologists, audiometric technicians, industrial hygienists, other occupational safety personnel as well as servicemembers with experience in combat or other missions with hazardous noise. We visited various installation work sites, including maintenance shops, a firing range, and an aircraft carrier to observe signs and labels designating hazardous noise areas or equipment; the availability of hearing protection equipment in or around such areas; and the use of personal hearing protection. We also observed audiologists and technicians conduct hearing conservation activities, including performing hearing tests, interviewing and educating servicemembers about hearing protection, and assessing appropriate fit and use of hearing protection equipment at noise hazardous sites.

**Table 2: Military Bases Visited during GAO Review of Hearing Conservation Programs**

Service	Base	Noise-hazardous areas observed
Army	Fort Meade (MD)	Vehicle security
	Fort Carson (CO)	Firing range
Navy	Naval Station Norfolk (VA)	Aircraft carrier
	Naval Station San Diego (CA)	Aircraft carrier
Air Force	Andrews Air Force Base (MD)	Maintenance shop
	Eglin Air Force Base (FL)	Maintenance shop
Marine Corps	Marine Corps Base Quantico (VA)	Air facility
	Marine Corps Base Camp Lejeune (NC)	Tank maintenance shop
	Marine Corps Base Cherry Point (NC)	Military aircraft, ground operations, and aircraft maintenance hangar

Source: GAO.

To further review DOD and the services' program evaluation efforts, we discussed performance goals, measures, and information systems at the leadership and the installation levels. We interviewed officials from NIOSH and OSHA—organizations responsible for creating hearing conservation program review standards for civilian workers, as well as DOD and armed services officials responsible for oversight of military hearing conservation programs. More specifically, we interviewed DOD officials and reviewed documentation related to the armed services' program evaluation activities, such as setting targets and reviewing performance trends. To determine the availability and usefulness of information to support program evaluation, we interviewed officials responsible for managing DOD's hearing conservation data system as well as officials who are familiar with and use the system, including installation hearing conservation program managers and technicians. We reviewed data dictionaries and other technical documentation for the Defense Occupational and Environmental Health System (DOEHRS), DOD's database for tracking servicemembers' hearing test results and their occupational exposure to noise and other hazards. After an internal review of standard data reports provided by the services, we determined that it would not be feasible to validate data consistent with GAO's reliability standards within our planned time frames.

To determine the status of the DOD Hearing Center of Excellence and its registry and efforts to share information to improve hearing protection, we



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interviewed officials from DOD, including the center's interim director and the representatives of the armed services and VA involved in these efforts. We also reviewed planning documents for the center and registry and data shared between DOD and VA.

# Appendix II: Comments from the Department of Defense



ACQUISITION,  
TECHNOLOGY  
AND LOGISTICS

OFFICE OF THE UNDER SECRETARY OF DEFENSE  
3010 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3010

JAN 19 2011

Mr. Daniel Bertoni  
Director, Education, Workforce, and  
Income Security Issues  
U.S. Government Accountability Office  
441 G Street, N.W.  
Washington, DC 20548

Dear Mr. Bertoni:

This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-11-114, "HEARING LOSS PREVENTION: Improvements to DOD Hearing Conservation Program Could Lead to Better Outcomes," dated December 7, 2010 (GAO Code 130967).

We provide in the enclosure the DoD responses to the GAO recommendations. We concur with all recommendations.

Sincerely,

Dorothy Robyn  
Deputy Under Secretary of Defense  
(Installations and Environment)

Enclosures:  
As stated

GAO DRAFT REPORT DATED DECEMBER 7, 2010  
GAO-11-114 (GAO CODE 130967)

"HEARING LOSS PREVENTION: IMPROVEMENTS TO DOD HEARING  
CONSERVATION PROGRAM COULD LEAD TO BETTER OUTCOMES"

DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATIONS

**RECOMMENDATION 1:** DoD and the services improve upon the type, timing, and tracking of training and education provided to servicemembers on hearing protection, by providing information that is more comprehensive and training that is more frequent and possibly earlier in servicemembers careers.

**DoD RESPONSE:** Concur. The Military Services are in various stages of developing and implementing improvements to the type, timing, and tracking of training and education of service members. The Office of the Secretary of Defense (OSD) will monitor progress of the Military Services in implementing improvements, provide for cross-flow of the lessons learned across the Military Services' improvements, and standardize those improvements across all Military Services as appropriate.

**RECOMMENDATION 2:** DoD work with the services to develop an appropriate set of performance indicators that assess how well services are reducing hearing loss among servicemembers.

**DoD RESPONSE:** Concur. Improved DoD performance indicators were issued in the update to DoD Instruction 6055.12, "Hearing Conservation Program (HCP)," dated December 3, 2010. The Military Services will review these indicators and develop additional indicators as needed to assist them in monitoring program execution and effectiveness.

**RECOMMENDATION 3:** DoD and the services address limitations in the processes used to capture, track, and use performance data. This effort should address issues with data reliability, data entry, reporting capability, and integration across relevant databases.

**DoD RESPONSE:** Concur. OSD and the Military Services will address a) limitations in the processes used to capture, track, and use performance data, and b) issues with data reliability, data entry, reporting capability, and integration across relevant databases.

**RECOMMENDATION 4:** DoD work with the services to examine the appropriateness and feasibility of expanding those service-level initiatives that hold promise of improving --- on a DoD-wide basis --- the military hearing conservation programs. Particular attention should be focused on those efforts that already appear to have either increased compliance with program requirements or have demonstrated the potential to reduce hearing loss among servicemembers,

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such as establishing hearing loss as a readiness issue, improving the comfort and design of hearing protection, and including noise experts more consistently in the procurement process.

**DoD RESPONSE:** Concur. OSD will continue to use the annual Safety & Occupational Health In-Progress Review and the DoD Hearing Conservation Work Group as mechanisms for direct cross-flow and application of individual Military Service improvement initiatives. Examples of initiatives include: standardizing criteria for evaluating hearing protection devices for entry into a qualified products list; improving the processes for weapon system procurement and use of engineering controls; implementing management system approaches that achieve high audiometric exam compliance rates; consolidating requirements for research and development of improved hearing protection; and using the results from audits of Military Service programs to improve compliance with safety requirements.

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# Appendix III: GAO Contact and Staff Acknowledgments

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## GAO Contact

Daniel Bertoni (202) 512-7215 or [bertonid@gao.gov](mailto:bertonid@gao.gov)

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## Acknowledgments

Brett Fallavollita (Assistant Director) and Michelle Bracy (Analyst-in-Charge) managed all aspects of the assignment. Julie DeVault, David Forgosh, Suzanne Rubins, and Melissa Baker made significant contributions to all aspects of this report. In addition, Walter Vance and Beverly Ross provided technical support in the design and methodology; James Rebbe provided legal support; Susan Bernstein and Mimi Nguyen assisted in the message and report development; and Sara Edmondson, Jessica Gray, Jonathan McMurray, and Ronni Schwartz assisted with quality assurance.

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